

Starter: Rewrite this code to use a for loop and the `range()` function:

```
print('~' * 0)
print('~' * 1)
print('~' * 2)
print('~' * 3)
print('~' * 4)
print('~' * 5)
print('~' * 6)
print('~' * 7)
print('~' * 8)
```

Starter solution

```
for number in range(9):  
    print('~' * number)
```

~

~~

~~~

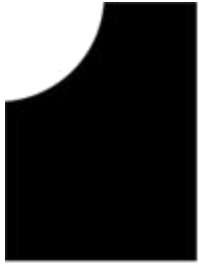
~~~~

~~~~~

~~~~~

~~~~~

~~~~~



Topics in this session:

1. Comparison Operators
2. Logical Operators
3. If Statements

Comparisons and Logical Operators

Boolean: A data-type that is either `True` or `False`

Comparison operator: compare values to determine wheter something is `True` or `False`

This code checks if the user has input 'Monday' using the == operator

```
today = input('What day is it? ')
is_monday = today == 'Monday'
print('Today is Monday: {}'.format(is_monday))
```

What day is it? Monday

Today is Monday: True

Summary of comparison operators in Python

Name	Python
Equal to	==
Not equal	!=
Greater than	>
Less than	<
Greater than or equal	>=
Less than or equal	<=

`float()` can convert strings to floats

This code checks if the current temperature is freezing:

```
temperature = input('What is the temperature? ')
is_freezing = float(temperature) <= 0.0
print('The temperature is freezing: {}'.format(is_freezing))
```

What is the temperature? 18

The temperature is freezing: False

Exercise 3.1: You have a budget of £10 and want to write a program to decide which burger restaurant to go to.

1. Input the `price` of a burger using `input()`
2. Check whether the `price` is less than or equal (`<=`) `10.00`
3. Print the result in the format below

```
Burger is within budget: True
```

Hint: remember to convert the input from a string to a decimal with `float()`

Solution

```
price = input('How much is a burger? ')
within_budget = float(price) <= 10.00
print('Burger is within budget: {}'.format(within_budget))
```

How much is a burger? 8.99

Burger is within budget: True

There are logical operators to combine multiple checks

Python	What it does
---------------	---------------------

<code>and</code>	both expressions are <code>True</code>
------------------	--

<code>or</code>	at least one expression is <code>True</code>
-----------------	--

<code>not</code>	reverse the expression (<code>True</code> becomes <code>False</code> and vice-versa)
------------------	---

This program will work out if you should visit Mars based on whether you want to visit and if you can afford it:

```
mars_choice = input('Would you like to visit Mars? y/n ')
is_willing = mars_choice == 'y'

affordable = input('Can you afford to visit Mars? y/n ')
can_afford = affordable == 'y'

should_visit_mars = is_willing and can_afford

print('You should visit Mars: {}'.format(should_visit_mars))
```

```
Would you like to visit Mars? y/n y
Can you afford to visit Mars? y/n n
You should visit Mars: False
```

Exercise 3.2: Add code to your burger program to input whether the restaurant has a vegetarian option The output should say whether the cost is within budget **AND** has a vegetarian option

```
Restaurant meets criteria: True
```

Solution:

```
price = input('How much is a burger? ')
vegetarian = input('Is there a vegetarian option? (y/n) ')

within_budget = float(price) <= 10.00
has_vegetarian = vegetarian == 'y'

is_good_choice = within_budget and has_vegetarian

print('Restaurant meets criteria: {}'.format(is_good_choice))
```

```
How much is a burger? 9.99
Is there a vegetarian option? (y/n) y
Restaurant meets criteria: True
```

If Statements

if statement: used to run a block of code depending on whether a condition is `True` or `False`

```
password = input('password: ')\n\nif password == 'jumanji':\n    print('Success!')
```

```
password: jumanji\nSuccess!
```

An `if` statement has the following:

1. The `if` keyword
2. A condition (comparison)
3. A colon
4. Body (indented four spaces)

condition

body

```
if house_number == 12  
    print('this is the house')
```

This program checks whether you are an admin and you have entered the right password:

```
name = input("What is your name? ")
is_admin = name == 'admin'

password = input("What is your password? ")
is_password_correct = password == 'dinosaurs'

if is_admin and is_password_correct:
    print('Welcome')

if not is_admin or not is_password_correct:
    print('Go away')
```

What is your name? admin

What is your password? tigers

Go away

Exercise 3.3: Rewrite the output of your burger program to use if statements

If it is a good choice it should be:

```
This restaurant is a great choice!
```

If it is **not** a good choice it should be:

```
Probably not a good idea
```

Solution

```
price = input('How much is a burger? ')
vegetarian = input('Is there a vegetarian option? (y/n) ')

within_budget = float(price) <= 10.00
has_vegetarian = vegetarian == 'y'

is_good_choice = within_budget and has_vegetarian

if is_good_choice:
    print('This restaurant is a great choice!')

if not is_good_choice:
    print('Probably not a good idea')
```

How much is a burger? 9.99

Is there a vegetarian option? (y/n) y

This restaurant is a great choice!

Else Statements

else statement: Used with an `if` statement and will run when the `if` condition is `False`

```
password = input('password: ')\n\nif password == 'jumanji':\n    print('Success!')\nelse:\n    print('Failure!')
```

```
password: cluedo\nFailure!
```


Here's the admin program rewritten to use `else` :

```
name = input("What is your name? ")
is_admin = name == 'admin'

password = input("What is your password? ")
is_password_correct = password == 'dinosaurs'

if is_admin and is_password_correct:
    print('Welcome')
else:
    print('Go away')
```

What is your name? admin

What is your password? tigers

Go away

Exercise 3.4: Now that you've nished your burger, you want to pay for your food. Let's write a program to calculate your meal and apply a discount if applicable.

If your total meal costs more than £20 and you have a discount, the price will be reduced by 10%. The program should print "Discount applied" or "No discount" depending on whether the discount criteria was met.

```
meal_price = float(input('How much did the meal cost? '))  
  
discount_choice = input('Do you have a discount? y/n ')  
discount_applicable = discount_choice == 'y'
```

Solution

```
meal_price = float(input('How much did the meal cost? '))
discount_choice = input('Do you have a discount? y/n ')

is_discount = discount_choice == 'y'
is_over_twenty = meal_price >= 20.0
discount_applicable = is_discount and is_over_twenty

if discount_applicable:
    meal_price = meal_price * 0.9
    print('Discount applied')
else:
    print('No discount')
    print('Total cost: {}'.format(meal_price))
```

```
How much did the meal cost? 30
Do you have a discount? y/n y
Discount applied
Total cost: 27.0
```

Elif Statements

elif statement: used after `if` statements to check whether another condition is `True` or `False`

```
dog_size = int(input('How big is the dog? '))

if dog_size > 75:
    print('That is a big dog')

elif dog_size < 25:
    print('That is a small dog')

else:
    print('That is an average dog')
```

```
How big is the dog? 10
That is a small dog
```

You can use multiple `elif` statements together

```
dog_size = int(input('How big is the dog? '))

if dog_size > 75:
    print('That is a big dog')

elif dog_size < 10:
    print('That dog could fit in my pocket')

elif dog_size < 25:
    print('That is a small dog')

else:
    print('That is an average dog')
```

How big is the dog? 6

That dog could fit in my pocket

Exercise 3.5: You're cooking a pizza and need to check that the oven is at the right temperature.

Write a program to:

- Ask the user to input the temperature
- Prints "The oven is too hot" if the temperature is over 200
- Prints "The oven is too cold" if the temperature is under 150
- Prints "The oven is at the perfect temperature" if the temperature is 180
- Prints "The temperature is close enough" for any other temperature

Solution

```
temperature = float(input('What is the temperature of the oven? '))

if temperature > 200:
    print('The oven is too hot')
elif temperature < 150:
    print('The oven is too cold')
elif temperature == 180:
    print('The oven is at the perfect temperature')
else:
    print('The temperature is close enough')
```

What is the temperature of the oven? 170

The temperature is close enough

Random

Python has a built-in library for random data

```
import random

random_integer = random.randint(1, 100)

print(random_integer)
```

The `randint()` function generates a random number between two values

This program uses `randint()` to simulate dice with any number of sides

```
import random

sides = int(input('How many sides does the die have? '))
random_integer = random.randint(1, sides)

print('You rolled a {}'.format(random_integer))
```

How many sides does the die have? 6

You rolled a 2

To practice if statements choose one of the following exercises in your student guide:

- Exercise 3.6: Flip a coin
- Exercise 3.7: Rock, Scissors, Paper
- Exercise 3.8: Roulette

Exercise 3.6: This program uses random to simulate a coin flip.

To finish the program you will need to add the following:

- If the random coin flip matches the choice input by the user then they win
- Otherwise if the random coin flip does not match the choice input by the user then they lose

```
import random

def flip_coin():
    random_number = random.randint(1, 2)
    if random_number == 1:
        side = 'heads'
    else:
        side = 'tails'
    return side

choice = input('heads or tails: ')
result = flip_coin()

print('The coin landed on {}'.format(result))
```

Exercise 3.7: This program simulates rock, paper, scissors. The first winning condition has been added.

To finish the program you'll need to add all of the other winning and losing conditions.

```
import random

def random_choice():
    choice_number = random.randint(1, 3)

    if choice_number == 1:
        choice = 'rock'
    elif choice_number == 2:
        choice = 'scissors'
    else:
        choice = 'paper'

    return choice

my_choice = input('Choose rock, scissors or paper: ')
opponent_choice = random_choice()

print('Your opponent chose {}'.format(opponent_choice))

if my_choice == 'rock' and opponent_choice == 'scissors':
    print('You win!')
```

Exercise 3.8: Not Quite Roulette

Ask the user to enter the following three things using `input()` :

- The amount they want to bet
- A colour (red or black)
- A number between 1 and 100

After generating a random number and colour:

- If the colour matches, the users keeps the amount that was bet
- If the number matches, the users wins double the amount that was bet
- If the colour and number matches, the users wins 100 times the amount that was bet
- When neither the colour or number matches the user wins 0
- Output the amount the user won

The following code will generate a random number and colour:

```
import random
```

```
def colour():  
    random_number = random.randint(1, 2)  
  
    if random_number == 1:  
        colour = 'red'  
    else:  
        colour = 'black'  
  
    return colour
```

```
random_number = random.randint(1, 100)  
random_colour = colour()
```


Recap

This session:

1. Comparison operators
2. Logical Operators
3. If Statements

Question 1: Equals to (==) is a comparison operator. Name two more comparison operators

Question 2: What is the output of this code?

```
print(True and True)
print(True and False)
print(True or True)
print(True or False)
```

Question 3: I expect this code to output "This is too many apples", but instead it outputs "That is a sensible number of apples". Why does this happen?

```
apples = 100

if apples >= 10:
    print('That is a sensible number of apples')
elif apples > 50:
    print('This is too many apples')
elif apples < 10:
    print('That is not enough apples')
```

Homework: Session 3 homework questions in your student guide